Asian Journal of Research in Biochemistry

Volume 14, Issue 3, Page 56-60, 2024; Article no.AJRB.116075
ISSN: 2582-0516

Phytochemistry and Evaluation of Acute Toxicity of Aqueous and Hydroethanolic Extracts of *Pavetta corymbosa* Leaves (Rubiaceae)

Miezan Bilé Aka Patrice [a*], Kouamé Yao Yves [a], Kouakou Yeboué Koffi François [a] and Kayo Blaise [b]

[a] Laboratoire de Biochimie, UFR Sciences Biologiques, Université Peleforo Gon Coulibaly, BP 1328, Korhogo, Côte d'Ivoire.
[b] Laboratoire de Pharmacognosie, UFR Sciences Pharmaceutiques et Biologiques, Université Félix Houphouët Boigny, 22 BP 582, Abidjan 22, Côte d'Ivoire.

Authors' contributions

This work was carried out in collaboration among all authors. All authors read and approved the final manuscript.

Article Information

DOI: 10.9734/AJRB/2024/v14i3287

Open Peer Review History:
This journal follows the Advanced Open Peer Review policy. Identity of the Reviewers, Editor(s) and additional Reviewers, peer review comments, different versions of the manuscript, comments of the editors, etc are available here: https://www.sdiarticle5.com/review-history/116075

Original Research Article

Received: 15/02/2024
Accepted: 19/04/2024
Published: 23/04/2024

ABSTRACT

Pavetta corymbosa (Rubiaceae) is a plant widely known in sub-Saharan Africa in the field of traditional medicine. It is used empirically against certain pathologies such as malaria, diabetes, hemorrhages and typhoid fever. However, there is no scientific data on its phytochemical and biological profile, so this study was carried out to research the chemical groups contained in the leaves of this plant and determine the toxicological parameters which would justify its use in traditional medicine. Several standard characterization methods were used for phytochemical screening of aqueous and hydroethanolic extracts of *Pavetta corymbosa* leaves. The study of the

**Corresponding author: E-mail: miezan.bile.aka@gmail.com;*

acute toxicity of the two types of extracts from the leaves of this plant was carried out according to the OECD guideline 423 using Wistar rats. Phytochemical screening indicated the existence of polyphenols, saponosides, quinones, flavonoids, polyterpenes and sterols in the two types of extracts of this plant, which would justify its biological and pharmacological effects. The study of the acute toxicity of these two types of extracts, administered intraperitoneally to Wistar rats, showed no mortality of the rats. These toxicological results allow us to qualify the leaves of *Pavetta corymbosa* as being non-toxic, hence the interest in its use in traditional medicine against certain pathologies.

Keywords: Pavetta corymbosa; phytochemical screening; acute toxicity; chemical groups.

1. INTRODUCTION

The *Pavetta corymbosa* shrub is a medicinal plant from sub-Saharan Africa which reaches approximately four (04) meters high. In Burkina Faso, Benin and Togo, the powder is used successfully for the treatment of diabetes, salmonellosis and hemorrhages [1]. In Ivory Coast, a decoction of the leaves is used against malaria [2]. Based on people's experiences, these same sheets are used in the case of open wounds [3]. However, there is little data on this plant regarding secondary metabolites and toxicological parameters such as acute toxicology. To justify its traditional use, this study was initiated with the aim of searching for the major chemical groups and evaluating the acute toxicity of aqueous and hydroethanolic extracts of *Pavetta corymbosa* leaves.

2. MATERIALS AND METHODS

2.1 Plant Material

The plant material consists of *Pavetta corymbosa* leaves collected in the Grand-Bassam area and identified at the National Floristic Center of Félix Houphouët Boigny University, in Ivory Coast.

2.2 Animal Material

Adult female rats of the Wistar variety with average weights between 120 and 130 g were fasted for 24 hours then used for the acute toxicity test by intraperitoneally route of aqueous and 70% hydroethanolic extracts of *Pavetta corymbosa* leaves. These spleens were provided by the animal store of the Faculty of Pharmaceutical and Biological Sciences of Félix Houphouët-Boigny University.

2.3 Preparation of the Two Types of Extracts

The aqueous extract was prepared from 100 grams of *Pavetta corymbosa* leaves powder in 1 L of boiling distilled water for ten minutes. The mixture obtained was filtered through cotton, then under vacuum with the Whatman No.4 paper filter. The filtrate obtained was dried in an oven at 40°C which constituted the crude total aqueous extract of *Pavetta corymbosa*. As for the 70% hydroethanolic extract, the Guédé-Guina [4] method was used. Thus 100 g of *Pavetta corymbosa* leaves powder was used for this purpose. The resulting mixture was homogenized using a magnetic stirrer for 24 hours. The solution was filtered through cotton then under vacuum under the same conditions as above. The filtrate obtained was concentrated on a rotary evaporator then dried in an oven at 40°C. The residue obtained constituted the 70% hydroethanolic extract of *Pavetta corymbasa*.

2.4 Phytochemical Study

“The phytochemical study of the aqueous and 70% hydroethanolic extracts of *Pavetta corymbosa* leaves was carried out using standard reactions for the characterization of chemical groups. These included chemical groups such as polyphenols, flavonoids, polyterpenes, quinones, saponosides tannins and alkaloids using the methods described by Trease and Evans” [5]. The detection of sterols and polyterpenes was carried out using the Liebermann reaction. The characterization of compounds belonging to the polyphenol group was carried out by the reaction with ferric chloride. The flavonoids were revealed by the cyanidrin reaction. The presence of tannins is highlighted by the iron trichloride solution. The appearance of a dark green or blue-green color indicates the presence of tannins. The general characterization of the alkaloids was carried out using the Dragendorff reagent. The search for saponosides was based on the property of aqueous solutions containing saponosides to foam after stirring. The presence of quinones was confirmed by a change to yellow following the addition of a few drops of NaOH.

2.5 Acute Toxicity Study

The acute toxicity of the two types of extracts was carried out according to the guideline of the Organization for Economic Cooperation and Development (OECD 423) [6]. The 0.9% sodium chloride (NaCl) solution was used for the preparation of different concentrations of *Pavetta corymbosa* extracts. The concentrations of aqueous and 70% hydroethanolic extracts were prepared taking into account the average weight of the rats and the quantity of products (mg/kg BW). The average weight of the rats was 120.9 ± 0.07g. The animals were fasted for 24 hours before administration of different doses of *Pavetta corymbosa* extracts and NaCl solution. For an injectable dose of 100 mg/kg body weight, 1 mL amounts of solution of each extract and saline were injected into each lot of rats. Thus lot 1 which is the control received the 0.9% NaCl solution. Lots 2, 3 and 4 respectively received doses of 300, 2000 and 5000 mg/kg of aqueous extract of *Pavetta corymbosa*. Furthermore, lots 5, 6 and 7 received doses of 300, 2000 and 5000 mg/kg of 70% hydroethanolic extract of the plant. The animals thus treated were subjected to continuous observation for 14 days with particular attention during the first 24 hours in order to note the clinical signs and mortalities of each lot.

3. RESULTS

3.1 Triphytochemistry

Triphytochemistry revealed the presence of several secondary metabolites in the aqueous extracts of *Pavetta corymbosa* leaves; these are sterols and polyterpenes, polyphenols, flavonoids and saponosides. As for the hydroethanolic extract, in addition to the chemical groups mentioned above, there is the presence of quinones (Table 1).

3.2 Acute Toxicity

After administration of aqueous and 70% hydroethanolic extracts of *Pavetta corymbosa* to adults female rats at doses of 300, 2000 and 5000 mg/kg body weight, there was no significant change in the behavior of the latter. In addition, no mortality was recorded during the 14 days of observation (Table 2).

4. DISCUSSION

"Phytochemical exploration highlighted the presence of certain chemical compounds in the aqueous and hydroethanolic extracts of *Pavetta corymbosa* leaves. The main active compounds identified are flavonoids, saponosides, polyphenols, quinones, polyterpenes and sterols. The presence of these metabolites indicates that the two types of extracts express biological activities. Numerous studies indicate that flavonoids have anti-inflammatory properties capable of regulating the functioning of the immune system" [7,8]. Furthermore, many flavonoids are capable of reducing the production of oxygen species [9]. "Among antioxidants, polyphenols are likely to react with most reactive oxygen species" [10]. "Likewise, flavonoids are likely to react with most reactive oxygen species" [11]. "Regarding mortality, no deaths were

Table 1. Triphytochemistry of aqueous and hydroethanolic extracts of *pavetta corymbosa*

Extracts	Sterols and polyterpenes	Polyphenols	Flavonoids	Tannins	Quinones	Alkaloids	Saponosids
Aqueous	+	++	++	-	-	-	++
Hydroéthanolic	++	++	++	-	+	-	+

+ : Presence
- : Absence

Table 2. Clinical signs and mortality observed following the administration of different types of extracts

	Aqueous Extract			hydroethanolic Extract		
Doses injected (mg/kg) bw	300	2000	5000	300	2000	5000
Abdominal constrictions	-	-	-	-	-	-
Immobility	-	-	-	-	-	-
Breathing accelerated	-	-	-	-	-	-
Paralysis of members	-	-	-	-	-	-
Animals feeding	+	+	+	+	+	+
mortality	0	0	0	0	0	0

+ : Correct diet
- : Absence of signs

observed at doses of 300, 2000 and 5000 mg/kg bw of aqueous and hydroethanolic extracts of *Pavetta corymbosa* leaves. The non-toxic nature of the hydroethanolic extract could be explained by the absence of tannins and alkaloids in said extract. The absence of tannins and alkaloids in the hydroethanolic extract would be linked to the presence of ethanol in the hydroethanolic mixture used as solvent; because tannins only dissolve in water" [11]. The non-toxic nature of the aqueous extract of *Pavetta corymbosa* leaves would be due to the fact that the combination consisting of *Pavetta corymbosa* powder and distilled water could not promote the extraction of toxic substances stored in the mucilage cells [12]. The globally harmonized classification system (GHS) according to OECD 4237 classifies aqueous and hydroethanolic extracts of *Pavetta corymbosa* leaves in category 5 and defines them as non-toxic substances according to the Hodge and Sterner scale [13] in rats.

5. CONCLUSION

This study allowed the characterization of certain chemical compounds in aqueous and hydroethanolic environments of *Pavetta corymbosa* leaves. The main active compounds present were flavonoids, polyphenols, quinones, polyterpenes and sterols. The presence of these metabolites could confer on this plant certain biological activities of important pharmacological interest. The study of the acute toxicity of *Pavetta corymbosa* leaves made it possible to classify this plant in the category of non-toxic substances. In view of the toxicological results, the leaves of *Pavetta corymbosa* can be considered a great hope in the treatment of pathologies such as malaria, diabetes, salmonellosis and hemorrhages.

ETHICAL APPROVAL

The experimental procedures and protocols used in this study were approved by the ethics committee, Health Sciences Committee, Félix Houphouët-Boigny University. These guidelines were in accordance with those of the European Council Legislation 87/607/EEC for the protection of experimental animals. Every effort has been made to minimize animal suffering and reduce the number of animals used.

ACKNOWLEDGEMENT

The authors thank Mr. Ouoplé Clément (UFR of Pharmaceutical and Biological Sciences, Félix Houphouët Boigny University) for his help with the experiments.

COMPETING INTERESTS

Authors have declared that no competing interests exist.

REFERENCES

1. Adjanohoun EJ, Aké-Assi L. Contribution to the census of medicinal plants in Côte d'Ivoire. National Floristic Center of the National University of Côte d'Ivoire. 1979; 1:23–30.
2. Guédé ZN, N'guessan K, Dibié ET, Grellier P. Ethnopharmacological study of plants used to treat malaria, in traditional medicine by Bete populations of Issia (Côte d'Ivoire). J Pharm Sci Res. 2010; 2(4):216–227.
3. Guédé-Guina F. Extraction of mansonin from Mansonia altissima as cardiovascular agent (Patent application). Ministry of Scientific Research, Ivory Coast. 1990; 35.
4. Trease G, Evans SM. Pharmacognosy, 15th Edition, English Language Book Society, Bailliere Tindall, London. 2002; 585.
5. Dohou N. Floristic, ethnobotanical, phytochemical approach and study of the biological activity of thymeleaelythroids. Doctoral Thesis. 2015 ;59. Available:dspace.univ-tlemcen.dz/bitstream/112/7722/1/ABEDDOU
6. OECD 423 Guideline for testing of chemicals: Acute toxicity, method by acute toxicity class ; 2001.
7. Wagner H, Bladt S. Plant drug analysis. A thin layer chromatographyatlas. 2nd edition, Springer (ed), Berlin, Heidelberg, Germany. 2001;384.
8. Serafini M, Peluso I, Raguzzini A. Flavonoids as anti-inflammatory agents. Proceedings of Nutrition. Society. 2010; 69(3):273–278.
9. Burke MD. Liver function: Test selection and interpretation of results. Review of Clinical and Laboratory Medicine. 2002; 22(2):377-90.
10. Yapi TA, Boti JB, Ahibo CA, Bighelli A, Casanova Tomi F. Composition of leaf and stem bark oils of Xylopia villosa Chipp. Journal ofEssential Oil Research. 2012;24: 253–257.

11. Verma S, Dubey SR. Lead toxicity induces lipid peroxidation and alters the activities of Antioxidant enzymes in growing rice plants. Plant Science. 2003;164:645-655.
12. Brunneton J Flavonoids. In: Pharmacognosy, phytochemistry: Medicinal plants. Liv. 3rd edition, technique and documentation (Paris). 1999;310-35.
13. Hodge HC, Sterner JH. Determination of substances acute toxicity by LD50. 1943;B50.

Peer-review history:
The peer review history for this paper can be accessed here:
https://www.sdiarticle5.com/review-history/116075